saitec offshore technologies

The *unceasing progression* of SATH technology.

From prototyping to industrialization

ETSIN April 18th, 2024

SAITEC

Company Overview

Saitec Group

Saitec Engineering

Founded in 1988, is one of the most prestigious engineering firms in Spain. The company provides a wide-range of engineering and project management services to both public and private clients on the following areas:

- Roads
- Railways
- Water
- Environment
- Industry and energy
- Architecture
- Consultancy

www.saitec.es

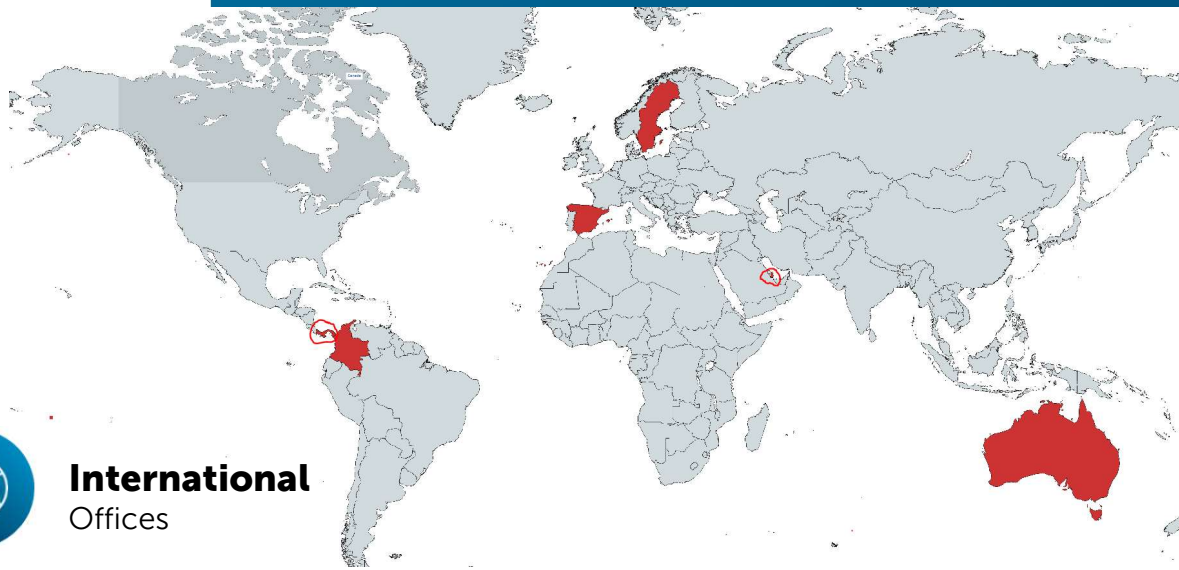
saitec offshore technologies

Saitec Engineering at a glance:

Bilbao
Headquarters

350+
Employees

35+
Years of experience



International
Offices

We want to contribute to our society with a reliable technology that can help to fight climate change

+40 technical and specialized professionals comprise a team working to shape the future of energy

Saitec Offshore Technologies

Saitec Offshore Technologies emerges as a spin-off from Saitec Engineering. Our primary emphasis revolves around:

1 SATH TECHNOLOGY

We started in 2016 focused on developing an innovative and economically efficient technology known as SATH (Swinging Around Twin Hull). An innovative and competitive concrete floating concept for offshore wind turbines suitable for shallow and deep waters (35m depth, onwards).

2 INDUSTRIAL PRODUCTION

Our company is ready to produce SATH platforms, enabling the achievement of energy transition goals through large-scale production and establishment in strategic port locations across the globe. We are ready to deliver turnkey solutions for the floating wind market.

3 CONSULTANCY SERVICES

In addition, we provide a wide range of engineering services related with the offshore wind. We bring deep knowledge and expertise to provide customized assessment to the floating offshore wind sector and stakeholders. Our approach ensures precise evaluations, empowering you to make informed decisions.

Our history

2012 First concept

2013 Concrete & Single Buoy Mooring

T1

2014 1st full time employee

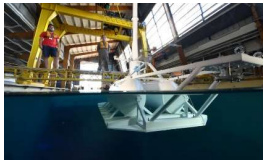
David enters the company

T2

1st Tank testing

Campaign at IHC

2016 Technology development



T3

Company creation

Saitec Offshore Technologies

T4

2017 Commercial action

2018 **Japanese subsidiary**

T5

2019 **SME i awarded**

2.7m€ EU Project

T6

2020 **Agreement with RWE**

Collaboration agreement & funding for DemoSATH

T7

BlueSATH commisioning

1:6 Scale in Santander Bay

T8

EASME SATHscale

3.4m€ EU Project

T9

DemoSATH construction Kickoff

Port of Bilbao November'20

T10

2021 Precommercial Tenders and Project develompment

T11

2023 **DemoSATH commissioning**

2MW in Basque Coast

T12

Agreement with KEPCO

T13

1st comercial tender

T14

2027 **Geroa Commissioning**

Many GWs to come!

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SATH

Technology description

SATH technology description

A flexible, low-carbon, low-cost offshore wind floater that promotes local content

Easy assembling and installation process

Assembling of structure is done onshore. Afterwards the platform can be easily installed or disconnected and taken ashore for major part repairs.

Single point mooring

Oil & Gas proven technology allows the platform to rotate facing the wind and reduces stresses on the mooring lines.

CO2

Concrete carbon footprint is significantly lower than the equivalent in steel.

Concrete

Use of concrete enables local content to manufacture the pre-cast elements in a industrialised way. Significant cost reduction in production and maintenance of parts.

The SATH floating platform is suitable solution for deep and shallow waters. The geometry of the floater provides a high level of stability, meets damaged stability criteria while a reduced concrete shell thickness can be used

SATH Technology description

Saitec starts in 2013 the design of a new type of floating platform to support wind turbines, called SATH® (Swinging Around Twin Hull), using proven technologies already tested in oil&gas projects, but adapted to give a satisfactory answer to the challenges related to harvest a natural resource with a different nature and energy intensity such as the wind.

Concrete A durable material that allows CAPEX & OPEX reduction	**Floaters** Its geometry leads to a reduced concrete shell thickness	**Reduced draught** Less than 10.5m, suitable for both shallow and deep waters
Plug & Play solution Easy installation suitable for quick disconnection	**Single point mooring system** The platform can rotate like a weathervane facing the wind	**Meets damaged stability criteria** Internally compartimentalized
Self-Stable Large water plane area, not requiring ballast	**Industrialized construction** Modular pre-cast elements	**Onshore construction & assembly** Reduced investment costs and risks

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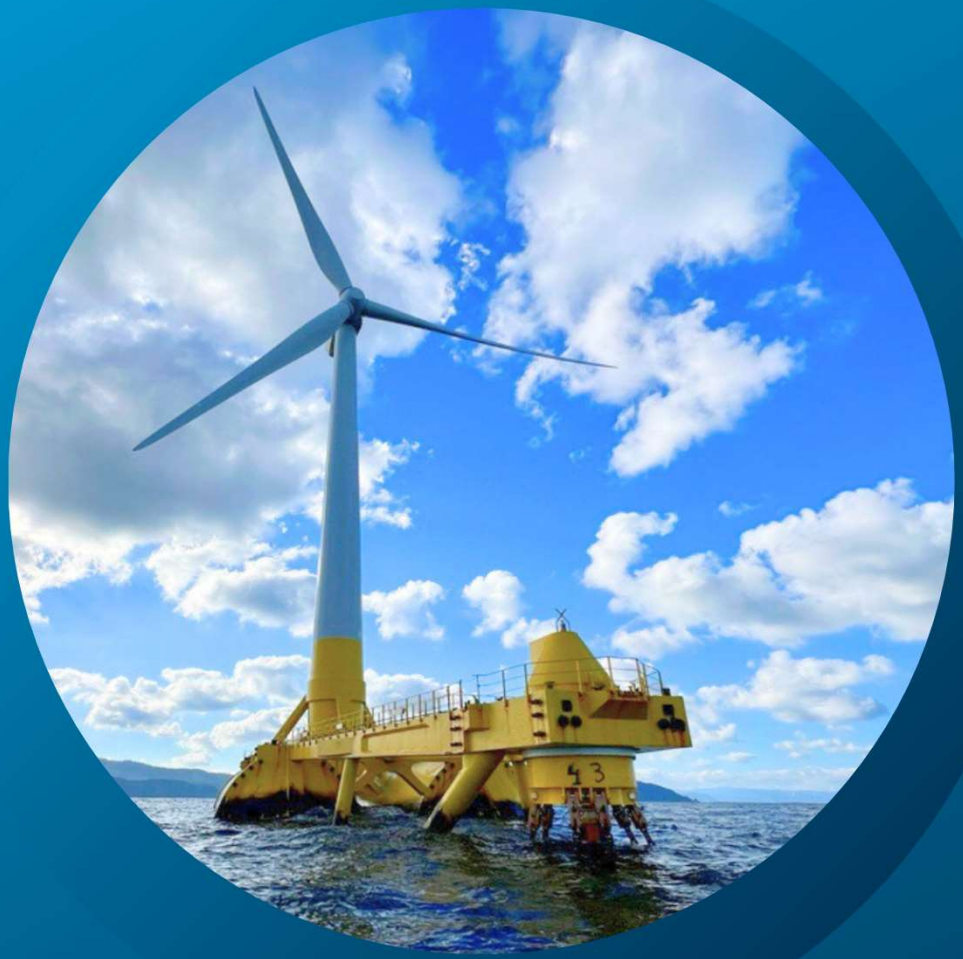


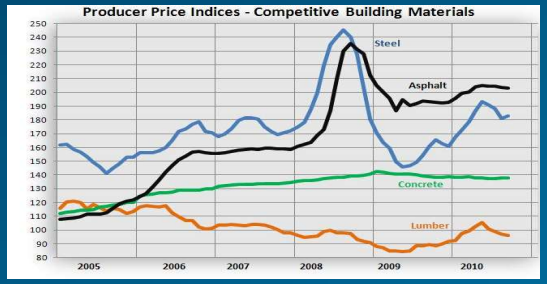
SATH

Technology advantages

SATH Technology advantages

1. Use of concrete

- Massive local content
- Lower manufacturing cost than steel



- Price stability
- Lower carbon footprint than steel

- Low Maintenance costs
- Long operational lifetime

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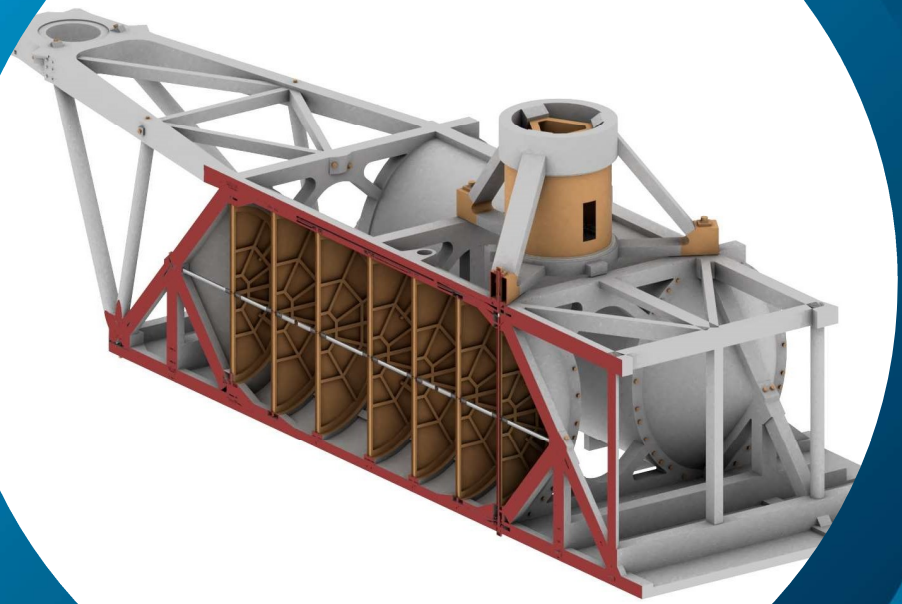
SATH Technology advantages



2. Floaters Geometry

The floaters have **cylindrical shape with ovoidal or circular cross section**. This shape allows a big reduction of the **wall thicknesses** and also the **weight** and **draft** of the platform.

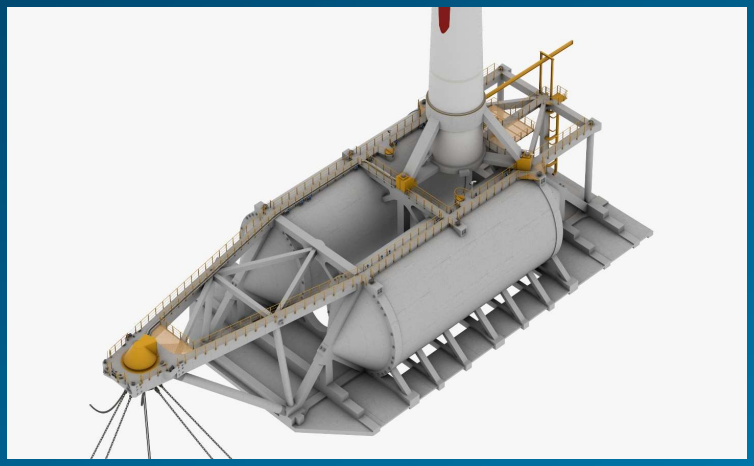
The floaters have internal transverse **bulkheads**, that stiffen the section and divide they in watertight chambers, providing **stability in damaged** conditions.

The floaters have also conical shells at their ends to get **hydrodynamic shape,** that reduce the **wave drift forces and the drag coefficient**.

SATH Technology advantages

3. Platform configuration

- The platform is a **twin hull ship shape** catamaran with the axis of the floaters in horizontal orientation. This shape provides a **high stability and low drag in transport.**
- The floaters are joined by transversal frames.
- A **heave plate** located at the lower part of the platform, increase the hydrodynamic **water added mass** and the viscous **damping**. It is designed to shift the pitch and roll natural oscillation periods outside of wave periods range, and to overdamp the heave oscillation motion, avoiding amplifications.



SATH Technology advantages

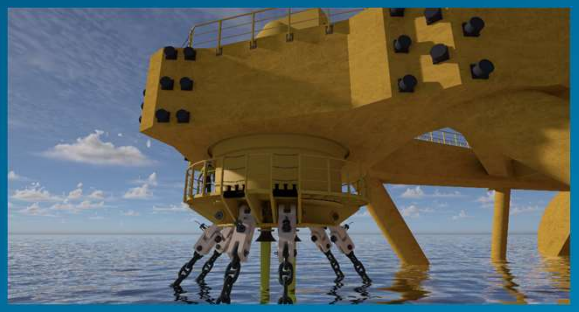
4. Single point mooring

- The SATH platform includes also an External Turret Single Point Mooring (**SPM**) System, that is a proven concept **from oil&gas**. This system allows the platform to freely rotate around a single points as a **weathervane**, reducing the environmental forces on the platform and the cost of the mooring lines.
  It also helps the turbine yaw control to orient the rotor plane perpendicular to the wind.

- As wind, currents and waves are not always codirectional, and the WT torque has a vertical component due to WT axis tilt and tower inclination**, the turbine yaw control system is also required** to maintain the rotor plane perpendicular to the wind. Otherwise, misalignment between wind and rotor axis can reach significant values, reducing the energy capture and increasing the fatigue of wind turbine elements.

- There are other design with SPM system that not use a yaw control system because of the proximity of the rotor blades to the structure or by other reasons and can suffer the mentioned disadvantages.

- Due to the SPM system, the **access t**o the SATH platform can be **located at the stern**, so that the CTV approach can be made **from leeward** and with the same equilibrium orientation with respect to the wind.



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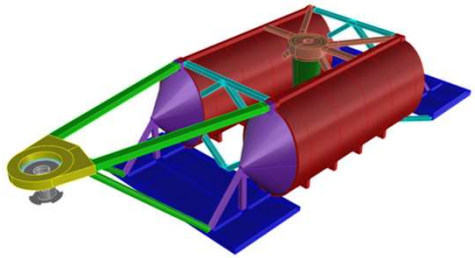
SATH

Technology development

SATH Technology development



Tank testing

SATH technology started officially when a EEA Grant was awarded for the Project “Research and Development of a Singular Type Of Floating Offshore Wind Platform and its Mooring System”. Since then, the following reduced scale tank tests have been performed:

- IHC (Instituto de Hidráulica Ambiental de Cantabria). Santander 2014 1/60th scale (5 MW).
- IHC Santander 2017 1/36th scale (2 MW).
- IFREMER (Institut français de recherche pour l'exploitation de la mer). Brest. 2018 1/36th scale (2 MW).
- University College Cork. Cork. 1/49th scale (10 MW). June & October 2019.
- Sintef Ocean. Norway. 1/36th Scale (10 MW). June to October 2021.

During these tests SATH platform has been withstanding 100-year return period waves of more than 22 m of significant wave (that is withstanding waves of up to 39.6 m).

SATH Technology development

Technology development is a progressive and continuous process which follows a path in which several milestones must be achieved. The most extended to determine the level of development of a technology is to classify it according to the Technology Readiness Level (TRL).
The table summarizes the key milestones that led to the current development of the design.

Concepts reaching the level of scaled tests in wave tanks belong to TRL 4-5, whereas full scale demonstration in operational environment places in the TRL 7 scale. SATH already reached TRL 7 after the 2MW prototype DemoSATH was connected to the Spanish grid in September 2023.

2013	2014 -2015	2016-2017	2023-2025	2027 →
TRL 2	**TRL 3-4**	**TRL 4-5**	**TRL 6-7**	**TRL 8-9**
SATH concept formulated	Software tool calibration and coupled analysis. Technology optimization and Patenting	1/35 Scale model design and tested. Positive results for scale model testing. IHC Santander and IFREMER (Institut Français de Recherche pour l'exploitation de la Mer)	DemoSATH: Testing and validation of a 2MW Demonstrator in open sea (BIMEP), connected to the Spanish grid.	Precommercial wind farm, GEROA (45MW)

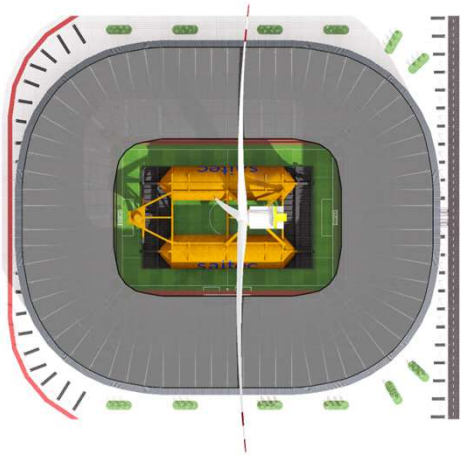
TRLs 6 and 7 truly appear as the **Valley of Death**, mainly due to the scale of **the investment** without significant revenues.

SATH technology development

Scale-up to 20 MW wind turbines

Due to the rapid evolution of wind turbine sizes, Saitec started the project SATHScale in 2018 with the aim of developing different platform sizes tailored to the new commercial large wind turbines.

SATH technology is easily scalable to 20 MW wtgs. Within the scope of the SATHScale project, SAITEC has developed designs for 10 MW, 12 MW, 16 MW and 18 MW based on data provided by WT manufactures.



Full scale prototype: DemoSATH

First offshore wind turbine connected to the grid in Spain

- Turbine: 2 MW wind turbine
- Base of the structure: 30 m. x 64 m.
- Installation: 2 miles off the coast in BIMEP
- Sea deep: 85 m.
- Mooring: Hybrid mooring lines (chains and fibre)
- Commissioned in September 2023
- It will collect data along 2 operational years for different purposes: technology development and other researches such as social, economical and environmental impacts.

Supply Chain< 25km | 75% of construction budget

BiMEP Biscay Marine Energy Platform · Bilbao PORT · ferrovial construcción · VICINAY marine · GRI Renewable Industries · haizea wind · AUXEMA stemmann · prosertek · ORMAZABAL velatia · euskalforging · CMA COMECARAN S.A. · SOVERIN CONTROL · GABOTEK MONTAJES INDUSTRIALES · TAMOIN · SC SPARBER GROUP

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RWE · Kansai Electric Power — power with heart

Joining forces

RWE and The Kansai Electric Power Co. Inc. are our partners in this journey towards floating wind development

Green energy

The electricity generated will be fed into the Spanish power grid with potential to supply energy to 2,500 homes.


DemoSATH
2024-02-22 18:17:58
WATCHTOWER

TV Documentary

DemoSATH hits the small screen!

WARNER BROS. DISCOVERY

'Megastructures in the Sea. DemoSATH wind turbine' showcases all the details of the floating wind pioneering project in Spain.

WATCH NOW

SATH Technology development

Precommercial projects: 2x50MW Spain by 2027

GEROA

GEROA (Green Energy Research for Offshore Atlantic) project is expected to be the first offshore wind farm in Spain with 3 to 5 turbines using SATH floating offshore wind technology off the Basque coast.

The electricity will be evacuated to the Spanish grid with a potential to supply green energy to 45,000 homes.
GEROA represents a key step forward in SATH's commercialisation and industrialization.

Medfloat

Medfloat Pilot Parc is a pre-commercial pilot park with 3 to 5 units and a total potential of 50MW to be installed in the Mediterranean Sea in 2025. The offshore wind turbines will use SATH technology in open sea in Girona (Spain).

Medfloat Pilot Parc will involve the creation of a test infrastructure in the Levantino-Balearic Demarcation for the testing, demonstration, and validation of SATH technology.

These projects will demonstrate the technical, environmental and social feasibility of future developments of floating offshore wind energy and particularly, of SATH technology.

SATH Technology development

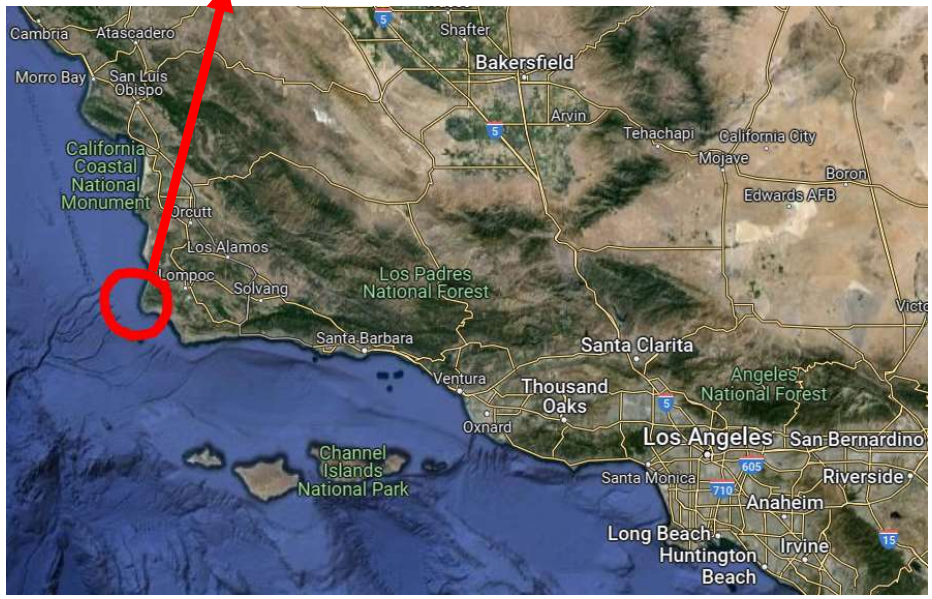
CADEMO Precommercial project

The CADEMO Project aims to develop, construct, install and operate the first offshore wind project on the west coast of the US with 4 offshore wind platforms.

The project has the potential to generate up to 60 Megawatts (MW) of renewable energy, which is enough to supply over 21,500 Californian homes, providing a new source of renewable energy for the consumer and to contribute to the State efforts in reducing its carbon emissions.

CADEMO will demonstrate the technical, environmental, economic, and social aspects of commercial offshore wind in California.

3 miles offshore of
Vandenberg Air Force Base



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GEROA

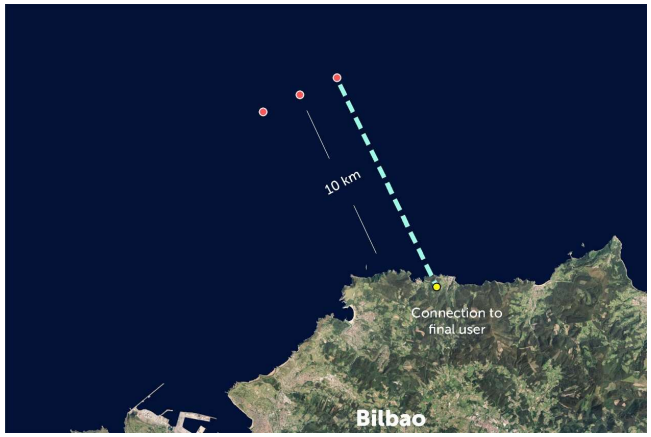
Precommercial Farm

GEROA

Project description

GEROA is expected to be the first offshore wind farm in Spain

- GEROA is the acronym for Green Energy Research for Offshore Atlantic, and also means “future” or “next” in Basque language.
- GEROA is an up to **50 MW** precommercial floating offshore wind project off the coast of Biscay, in Spain.
- It consists of 3 high-capacity (15MW+) wind turbine generators
- The 3 WTGs will use Saitec’s SATH solution as floating foundation technology.
- The project has a high potential to forge a Power Purchase Agreement (PPA) with a local off-taker involving direct connection (no connection to the grid will be required)



GEROA

Project objectives: Potential to be the first offshore wind farm in Spain

GEROA site (BiMEP-2) has been published in the Spanish Marine Spatial Planning (POEM) as an R&D zone for offshore wind development outside any environmentally protected or sensitive area.

GEROA fits within the current Spanish Offshore Wind Regulatory Framework:

- It has been certified as R&D project (certificate issued by a Spanish government recognized certifier).
- The project's maximum installed capacity is ≤50MW.

Unique opportunity to supply power directly to a private consumer avoiding the grid connection permit.

The project enjoys robust support from the Basque Government, as highlighted by the MoU between Saitec and the Basque Energy Agency (EVE), ensuring smooth progress and potential incentives.

Know-how on the procedures that need to be followed, similar to previous experience with DemoSATH.

Saitec Offshore

Industrial strategy

Early development of ports infrastructure to meet growing demand for installation and O&M services

The existing infrastructure of the A Coruña port bears significant potential for FOW deployment

- With a total area of **190 ha** there is space for the assembling, outfitting and storage of turbines and substructures
- Over **1,500 meters of berth** with **a draft of 15.35 to 21.85 meters** provide significant room for the installation and wet storage of substructures
- Industrial estates nearby have **additional land available** that could be used for installing production and storing
- An existing motorway connects the industry in proximity with the port and **a rail network is currently under development**
- The port is in a **strategically favorable position** in the northern part of Europe to provide its services
- There is a new **experimental area** under development, which will allow testing prototypes of **TRLs between 7 and 9** in actual open sea conditions to speed up the development of substructure devices to mature further

A Coruña is already committing to support the floating offshore wind projects and their deployment

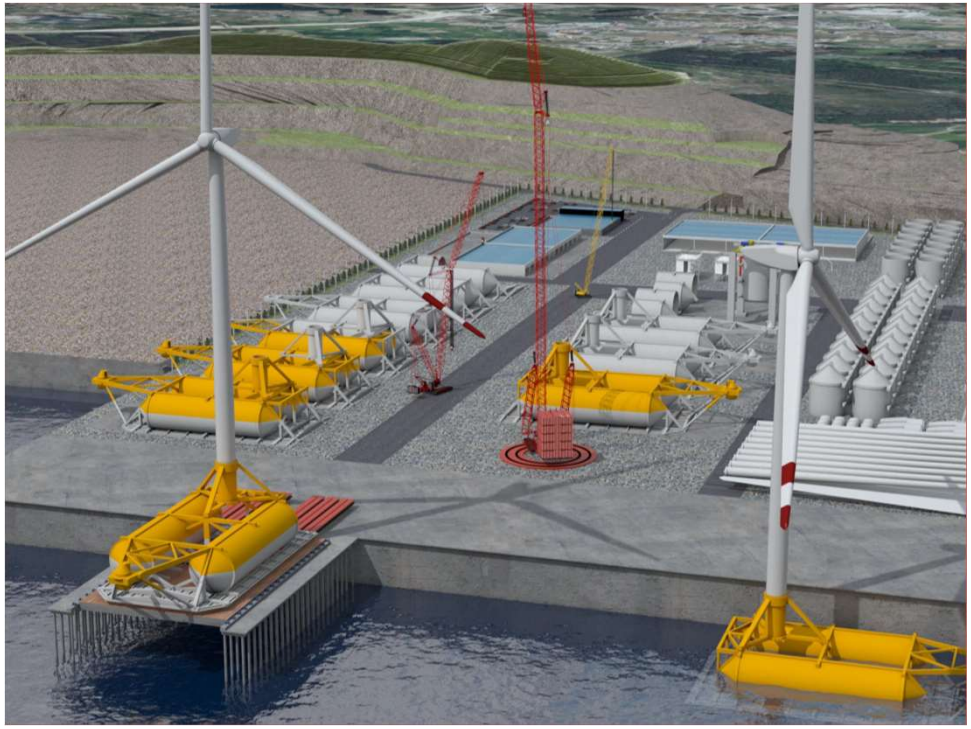
Saitec already has detailed plans worked out to upgrade the A Coruña port facility

Port upgrades require significant investments to include all necessary activities to move from raw materials to the final floater substructure that can be installed on site

- Pre-casting
- Assembly
- Auxiliary utilities
- Storage
- Load-out and turret assembly

The development of A Coruña is planned in two phases

- **Phase 1**: The initial development of the hub will have a maximum fabrication capacity of 225 MW/year (15 x 15 MW WTG)
- **Phase 2:** The further development to widen the area will increase the number of facilities that can be incorporated to reach full production capacity of 1 GW/year (50 x 20 MW WTG)



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